TELECONFERENCE SYSTEM, TELECONFERENCE SUPPORT METHOD, AND COMPUTER PROGRAM

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a teleconference system, a teleconference support method, and a computer program for realizing cooperative work of two or more persons through a network and in particular to a teleconference system, a teleconference support method, and a computer program for connecting a plurality of sites and realizing remote cooperative work.

More particularly, the present invention relates to a teleconference system, a teleconference support method, and a computer program for providing a shared workspace for one conference participant to easily connect conference systems with any other conference participant and sharing information among them and in particular to a teleconference system, a teleconference support method, and a computer program for enabling conference participants to smoothly share information of files such as a presentation data file in a plurality of conference systems using multimedia.

Description of the Related Art

Nowadays, demand for the network computing technology for connecting computers is growing. Cooperative work can be smoothly conducted in a network connection environment by sharing computer resources and sharing, distributing and exchanging information.

For example, a videoconference system can be named as a system for realizing cooperative work of two or more persons through a network. According to the videoconference system, an image and voice are transferred between conference rooms at distant points and while the participants can see their faces each other displayed on television screens, a conference can be operated. Proceedings can be progressed as if the participants actually existing at remote sites existed in the same conference rooms. Since the participants do not actually move, good use of time can be made and costs of travel expenses can be reduced.

The videoconference system is generally made up of image and voice input and output units such as cameras, microphones, monitors, and loudspeakers, image and voice coders and decoders, and communication units and lines for connecting the sites. To share data between remote conference rooms, electronic whiteboards are provided for writing each other and application software is shared and operated.

Recently, use of a cooperative work system between remote sites by conducting two-way communications including a videoconference has been increasing with the widespread use of continuous connection of the Internet and high-speed communications including xDSL and CATV.

In holding a teleconference at a plurality of sites using a videoconference system, the following are required:

(1) Connecting two systems installed respectively at each of the sites and distributing video and audio recorded at each sites; and

(2) sharing materials required in the conference.

In a conventional videoconference system, to connect systems to each other, the conference participants need to perform the following procedure:

(1) In point-to-point connection, the name and address of the connection destination are input to the apparatus installed at the site and the connection destination is called and connected.

(2) To connect three or more sites, the addresses of the systems at the sites are registered in an apparatus called multipoint connection apparatus and the sites are called from the multipoint connection apparatus and are connected.

In a conventional teleconference system, the systems

are connected by communication lines of a line switching system such as telephone lines and therefore the systems basically are connected in a point-to-point connection manner.

5   The multipoint connection apparatus is designed for connecting such three or more systems; the multipoint connection apparatus and the site apparatus installed at the sites are connected, whereby star connection is formed. The multipoint connection apparatus provides functions of

10   manually selecting video of one site distributed to each site and selecting video distributed as audio is input. The multipoint connection apparatus in the related art is mainly used when three or more sites are connected for holding a teleconference, and is positioned as a hub of

15   star connection for realizing connection of all sites by line switching. (See FIG. 56.)

       For example, some teleconference systems using multimedia provide a graphical user interface having icons such of a conference table, a conference seat and a

20   telephone, imitating an actual conference room so that even participants unskilled in the conference system procedure can easily use the system, and enable any other conference participant to set a call using multimedia by using the telephone icon. (See JP-A-8-251568.)

25   On the other hand, "ubiquitous" is proposed as the

- 4 -

direction pursuing in the future computers and networks. For example, it is desired to take out all knowledge regardless of the site or time.

The word "ubiquitous" or "ubiquitous computing" was proposed by Mark Weiser in Xerox PARC Laboratory and refers to "environment in which the user can use the capability of a computer having similar performance if the user moves anywhere." Computers are introduced as joined together with routine workspace regardless of whether or not the user possesses a computer machine such as a PC (Personal Computer) or a PDA (Personal Digital Assistance) devices when accessing information, and the computer capabilities of information collection, management, analysis, any other computation processing, information display, information distribution, are provided for the user without being aware of the user.

The ubiquitous technology is applied to the teleconference system, whereby not only formatted information such as information in a computer file, but also individual implicit information, namely, the flexibility of workspace is enhanced, collaboration exceeding the frames of offices, enterprises, nationalities, etc., is realized, and the possibility of business is widened.

For example, as for file sharing, a network system

is proposed wherein files held by mobile computers can be shared among the computers on a temporarily configured network. (See JP-8-070300.) In this case, to implement the network system, message communications between the mobile computers are conducted with the transmission source and destination addresses specified and address translation of the fixed addresses on the network and the addresses of the mobile computers connected to the network is performed. However, it is necessary to provide a mechanism for connecting the address translation machine and the mobile computers and previously determine whether or not file sharing is enabled. The conscious preliminary steps for file sharing need to be taken and unformatted information cannot be shared.

A conference system wherein shared materials used for a conference can be easily provided and stored is proposed. (See JP-A-2002-041429.) In this case, videophone conference service is provided through an Internet portal site and the conference participants use communication terminals to participate in a conference in real time with shared materials through the Internet portal site. However, application software needs to be previously downloaded into the terminals of the conference participants.

SUMMARY OF THE INVENTION

It is an object of the invention to provide an advantageous teleconference system, an advantageous teleconference support method, and an advantageous computer program for making it possible to connect a plurality of sites and realize remote cooperative work.

It is another object of the invention to provide an advantageous teleconference system, an advantageous teleconference support method, and an advantageous computer program for making it possible to provide a shared workspace for one conference participant to easily connect conference systems with any other conference participant and share information among them.

It is a further object of the invention to provide an advantageous teleconference system, an advantageous teleconference support method, and an advantageous computer program for making it possible to realize cooperation call setting and information sharing from a plurality of conference systems using multimedia.

It is a further object of the invention to provide an advantageous teleconference system, an advantageous teleconference support method, and an advantageous computer program for making it possible to smoothly collect, manage, analyze, display and distribute information used in a conference based on easy user operation.

In order to achieve the object of the invention, according to a first aspect of the invention, there is provided a teleconference system for supporting realization of cooperative work among a plurality of conference systems, the teleconference system including: site systems each being installed at a plurality of sites respectively, and each configured to operate the corresponding conference system; and a shared workspace server configured to connect the site systems to each other and to share a workspace of an object for managing and using a task as a cooperation unit among the sites.

According to a second aspect of the invention, there is provided a teleconference support method for supporting realization of cooperative work among a plurality of conference systems, the method including: providing a workspace including one or more sessions; opening the workspace in response to workspace selection of a user; adding the opened workspace to an active workspace; and managing use of the workspace.

According to a third aspect of the invention, there is provided a computer program described in a computer-readable format so as to execute processing for supporting realization of cooperative work among a plurality of conference systems in a computer system, the computer program including: means for providing a

workspace including one or more sessions; means for opening

the workspace in response to workspace selection of a user;

means for adding the opened workspace to an active

workspace; and means for managing use of the workspace.

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BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages

of the invention will be apparent from the following

detailed description of the preferred embodiments of the

10   invention with reference to the accompanying drawings,

wherein:

FIG. 1 is a drawing to schematically show a

configuration of a teleconference system according to an

embodiment of the invention;

15   FIG. 2 is a drawing to schematically show a functional

configuration of a site server for operating a conference

(such as a videoconference) in a site system;

FIG. 3 is a drawing to schematically show a functional

configuration of a shared workspace server;

20   FIG. 4 is a drawing to schematically show how a

plurality of shared workspaces are joined by hyperlink;

FIG. 5 is a drawing to show a screen display example

of prompting the user to log in to the system using IC card;

FIG. 6 is a drawing to show an example of listing a

25   set of workspaces transmitted from the shared workspace

server;

FIG. 7 is a drawing to show an example of connecting the IC card to the site server for entering a command to end the use of the system;

FIG. 8 is a drawing to show an example of listing a set of workspaces transmitted from the shared workspace server in the site server;

FIG. 9 is a drawing to show a screen example of listing a set of shared workspaces relevant to two users;

FIG. 10 is a drawing to show a screen display example of a file reference list retained in a shared workspace;

FIG. 11 is a drawing to show an example wherein an application associated with a selected file is started at a site and the file is displayed on an electronic whiteboard at the site;

FIG. 12 is a drawing to show how a user performs screen input using a user input unit such as a pointing device or a keyboard on the electronic whiteboard (or the client terminal);

FIG. 13 is a drawing to show a display example of the electronic whiteboard as a result of terminating the operation of application in response to a user command;

FIG. 14 is a drawing to show a screen display example of the electronic whiteboard when the user terminates the use of the system by connecting the IC card to the site

server;

FIG. 15 is a drawing to show an example wherein the user connects the IC card to a site server, authentication processing is performed, and relevant shared workspaces (projects) are listed on an electronic whiteboard in conference room B corresponding to a site system;

FIG. 16 is a drawing to show an example wherein references to files contained in project Y are listed as a result of the user selecting project Y on the electronic whiteboard in conference room B;

FIG. 17 is a drawing to show an example wherein the application associated with file K is started in the shared workspace server and performs graphic output on the electronic whiteboard as a result of the user selecting file K on the electronic whiteboard in conference room B;

FIG. 18 is a drawing to show an example wherein the display is returned to listing of references to files contained in the project as a result of the user giving an application end command on the electronic whiteboard in conference room B;

FIG. 19 is a drawing to show how the user connects the IC card in conference room B for terminating the use of the workspace;

FIG. 20 is a drawing to show how as the user connects IC card to the site server in the site system, the shared

workspaces relevant to the user are listed on the display in the site system;

FIG. 21 is a drawing to show how a list of references to files contained in project X is displayed on the electronic whiteboard;

FIG. 22 is a drawing to show how as a different user connects IC card to the site server in the site system, the shared workspaces relevant to the user are listed on the display in the site system;

FIG. 23 is a drawing to show how the video and audio data received from the associated video and audio server is displayed on the electronic whiteboards;

FIG. 24 is a drawing to show how information of screen display received from the shared workspace server is displayed on the electronic whiteboards in the site systems;

FIG. 25 is a drawing to show how the users at the sites make entries through the electronic whiteboards and exchange multimedia information using the video and audio servers for advancing the conference;

FIG. 26 is a drawing to show how the users at the sites make entries through the electronic whiteboards and exchange multimedia information using the video and audio servers for advancing the conference;

FIG. 27 is a drawing to show how the users at the sites

make entries through the electronic whiteboards and exchange multimedia information using the video and audio servers for advancing the conference;

FIG. 28 is a drawing to show how the users at the sites make entries through the electronic whiteboards and exchange multimedia information using the video and audio servers for advancing the conference;

FIG. 29 is a drawing to show how the display on the electronic whiteboard in conference room A is returned to the project file list as the user enters an application end command;

FIG. 30 is a drawing to show how the site server terminates the session as the user enters an end command;

FIG. 31 is a drawing to show how the site server terminates the session as the user enters an end command;

FIG. 32 is a drawing to schematically show a general shared workspace flow;

FIG. 33 is a flowchart to show a processing procedure for use of workspace;

FIG. 34 is a flowchart to show the workspace termination processing procedure in the flowchart of FIG. 33 in more detail;

FIG. 35 is a flowchart to show the object reference registration processing procedure in the flowchart of FIG. 33 in more detail;

FIG. 36 is a flowchart to show the subworkspace starting processing procedure at step S15 in the flowchart of FIG. 33 in more detail;

FIG. 37 is a flowchart to show the workspace deactivating processing procedure at step S42 in the flowchart of FIG. 36 in more detail;

FIG. 38 is a flowchart to show the workspace switching processing procedure at step S14 in the flowchart of FIG. 33 in more detail;

FIG. 39 is a flowchart to show the unregistered history save processing procedure at step S21 in the flowchart of FIG. 34 in more detail;

FIG. 40 is a flowchart to show a workspace reference processing procedure;

FIG. 41 is a flowchart to show a session start processing procedure;

FIG. 42 is a drawing to show an implementation example of the site system;

FIG. 43 is a drawing to show disposing of application operation buttons such as print, display, and listing of shared documents on a wall;

FIG. 44 is a general view of a conference room according to the embodiment of the invention;

FIG. 45 is a drawing to show a configuration example of an extended user interface screen in a conference room

according to the embodiment of the invention;

FIG. 46 is a drawing to show how two users hold their IC cards over the read face of an IC card authentication section installed on a table

FIG. 47 is a flowchart to show a file distribution processing procedure applied when one user displays a plurality of files;

FIG. 48 is a flowchart to show a file distribution processing procedure applied when a plurality of users display a plurality of files;

FIG. 49 is a drawing to describe a procedure to establish a session between remote site systems;

FIG. 50 is a drawing to show the operation to reference a file in a session;

FIG. 51 is a drawing to show the operation to reference a file in a session;

FIG. 52 is a drawing to show the operation to reference a file in a session;

FIG. 53 is a drawing to show the operation to reference a file in a session;

FIG. 54 is a drawing to show the operation to reference a file in a session;

FIG. 55 is a drawing to schematically show the configuration of a metadata schema managed in a metadata manager; and

FIG. 56 is a drawing to schematically show the configuration of a system using a multipoint connection apparatus for realizing connection of three or more sites (related art).

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the accompanying drawings, a description will be given in detail of preferred embodiments of the invention.

Configuration of teleconference system

FIG. 1 schematically shows the configuration of a teleconference system 1 according to an embodiment of the invention. As shown in the figure, the teleconference system 1 has two site systems 10 and 20 connected by a shared workspace server 30. In the example shown in the figure, the shared workspace server 30 connects the two sites (namely, conference systems) for simplicity of the drawing, but it is to be understood that the shared workspace server 30 is not limited to point-to-point connection and can connect three or more sites.

The shared workspace server 30 differs from a multipoint connection apparatus positioned as a hub of star connection of systems using communication lines of a line switching system such as telephone lines. The shared workspace server 30 manages sessions for managing

connection of the conference systems, files used in conferences and created as records of the conferences, reference information to resources relevant to conferences, and history information of file access made by conference

5 participants which will be described later.

The site systems 10 and 20 correspond to separately operating conference systems and a conference is operated for each site. Each of the site systems can be configured based on a videoconference system in a related art. For

10 example, video and audio servers 11 and 21 are provided and images and voice are input and output using cameras, microphones, monitors and loudspeakers and are coded and decoded and then are transmitted to and received from any other site system for sharing motion and behavior of the

15 participants at the sites.

Electronic whiteboards 12 and 22 are also provided for writing at the sites. Application software is shared between the site systems and is operated. In the embodiment, a graphical user interface (GUI) provided by

20 a shared workspace is presented on each of the electronic whiteboards 12 and 22, and enables the conference participant to connect to a multimedia communication conference system and access information in files relevant to the conference and the like (described later).

25 Each conference participant at each site becomes the

user of the teleconference system 1. The conference participant can operate the graphical user interface provided by the shared workspace, thereby connecting to the multimedia communication conference system without

5   being aware of the call address of each multimedia communication conference system and easily accessing information in the files relevant to the conference and the like from the conference system.

    An authentication unit for authenticating

10   identification of the conference participants is installed in each of the site systems 10 and 20. In the embodiment, each participant carries an IC card as personal identification medium and the site systems 10 and 20 are provided with card readers 13 and 23 for reading IC cards

15   and can perform authentication processing and checking authorization.

    In the teleconference system 1 of shared workspace type as shown in FIG. 1, the following can be realized for supporting the cooperative work between remote sites:

20   (1) Immediately connecting to the associated party of cooperative work;

    (2) immediately taking out a document required for cooperative work; and

    (3) immediately passing the result of cooperative

25   work to the following step.

The teleconference system 1 according to the embodiment provides modality and a combination of modalities required for cooperative work for each site. For example, presentation materials such as voice and files,

5   electric whiteboard, face video distribution, and remote cooperative edit can be put into a package for use.

In the teleconference system 1, a document relevant to cooperative work is presented and automatic connection to members participating in cooperative work is made,

10   whereby space for cooperative work is individually adapted to each group work (site).

In the teleconference system 1, real-time cooperative work and non-real-time cooperative work are associated with each other. That is, real-time cooperative work is

15   recorded (for example, presentation materials using the electronic whiteboard are saved) and is associated with non-real-time cooperative work, and a document is related to real-time cooperative work to associate non-real-time cooperative work with real-time cooperative work.

20   The schematic operation procedure of the teleconference system 1 of shared workspace type according to the embodiment is as follows:

(1) To use the conference system, the user selects the shared workspace (logs in to the workspace or accesses

25   with authentication).

For example, the user inputs his or her ID to the system using the IC card corresponding to the shared workspace. Alternatively, the user personally logs in to the system and selects the workspace by performing GUI operation.

(2) The user opens the shared workspace and understands who shares the workspace at present and who is communicating in the conference system at present.

(3) If the user selects "conference" in the shared workspace, the user can participate in a teleconference from the site (a plurality of conferences such as a general conference and a conference in which specific persons participate may be open in the shared workspace).

(4) A document can also be placed in the shared workspace. The document is referenced during the conference and the image on the electronic whiteboard in the conference is saved.

(5) The shared workspaces are hierarchically organized and are liked with each other by hyperlink.

(6) The user can reference subworkspace while participating in shared workspace.

(7) The user operates subworkspace to disclose information in shared workspace (drag and drop from personal workspace).

The user can hold the IC card to the site system 10

to which the user belongs, thereby logging in to the system

through predetermined authentication processing. After

the user logs in, the workspaces relevant to (authorized

for) the user are listed in the site system 10. The

5   workspace mentioned here corresponds to one conference.

If another user subsequently holds the IC card to the site

system 10 for logging in to the system, when the user is

permitted to log in to the system through similar

authentication processing, the workspaces common to those

10   for the user previously logging in to the system are listed.

If the user selects a specific workspace, shared documents

(files) linked with the workspace are listed. On the other

hand, if the same workspace is selected in a remote site

system, workspace connection is established between the

15   site systems and similar operation to that in the local

site system is performed. A history of operation such as

file open and edit of the shared documents in the workspace

is held for the later use as a search key. Local and remote

are not distinguished from each other in activities in the

20   workspace.

FIG.   2   schematically   shows   the   functional

configuration of a site server 100 for operating a

conference (such as a videoconference) in the site system

10. It is to be understood that a site server 200 in the

25   site system 20 has a similar configuration although not

shown.

The site server 100 includes an authentication module for executing a part of an authentication step at the site, a subsystem management module for managing the network addresses of subsystems making up the site system such as the electronic whiteboard and the video and audio server installed at the site, and a site server manager for managing the modules.

The site server 100 communicates with the shared workspace server 30 for enabling use of workspace based on authentication information and authorization information read from the IC card of the conference participant using the connected card reader 13.

In each workspace, sessions for managing connection of the sites, namely, the conference systems, files used in conferences and created as records of conferences, reference information to resources relevant to conferences, and history information of file access, resource access made by the conference participants are managed.

In the site system 10, the graphical user interface is provided and the conference participants can use the user interface to specify the same session provided in the session, thereby setting a call of cooperative work and sharing information. The resources relevant to each conference, for example, may exist in the site system 10

or may be stored in another storage area in the site or a server outside the site and, for example, are described in URL (Uniform Resource Locator) format. The access history is information such as access occurrence places,

5   access users and access times.

An access control list (ACL) is assigned to the session, file, reference information, and access history information in the workspace. A workspace manager 31 not only can manage or limit use in workspace units, but also

10 can perform access control finely in session units, file units, reference information units, or access history information units in the workspace (which will be described later).

The site server 100 is implemented as predetermined

15 server application is started in a general computer system such as a personal computer (PC) and a workstation (WS) connected through the network.

FIG. 42 shows an implementation example of the site system 10. The site system 10 shown in the figure is made

20 up of a web interface 1001 for the user such as a conference participant to access via a user interface (not shown) of an information terminal, a directory service 1002 for managing personal data, an IC card authentication section 1003 for performing authentication processing when the

25 user logs in to the system or a shared document is

distributed, a document archive 1004 for storing shared documents in the site, a metadata manager 1005 for acquiring and managing an access history to the shared documents and a miscellaneous activity history of the users logging in to the system as metadata, and a presentation controller 1006.

The web interface 1001 provides an entry for the user such as a conference participant to access via a user interface (not shown) of an information terminal.

The directory service 1002 manages the personal data about the users (conference participants) in the site.

The IC card authentication section 1003 performs authentication processing when the user logs in to the system or a shared document is distributed using the very short range communication technology of IC cards and tamper-proof authentication technology, which is conventionally well known.

The document archive 1004 stores the shared documents in the site, such as presentation files used in conferences.

The metadata manager 1005 acquires information of an access history to the shared documents, a miscellaneous activity history of the users logging in to the system in the site, distribution (taking back) of the shared documents on the background of the workspace and manages

the information as metadata.

The presentation controller 1006 provides an interface for enabling the users (namely, conference participants) to collaborate in the workspace of a conference. The presentation controller 1006 is implemented in various manners. For example, user interfaces of a general computer, such as a display, a keyboard, a mouse, and a tablet may be installed in a conference room as they are. Alternatively, a projection screen onto a wall through a projector, a camera for capturing user operation on the projection screen, and a whiteboard are used in combination to make up a user interface. Application operation buttons such as print, display, and listing of shared documents are disposed on the wall (see FIG. 43). Of course, a probe for detecting a user command without user's consciousness may be disposed in the conference room.

Information can be accessed irrespective of whether or not the user possesses a computer machine such as a PC or a PDA device depending on how the presentation controller 1006 is implemented. FIG. 44 is a general view of a conference room according to the embodiment of the invention. Computers are introduced as joined together with the workspace shown in the figure, and the computer capabilities of information collection, management,

analysis, any other computation processing, information display and information distribution are provided for the user who is unaware of them. That is, not only formatted information such as information in a computer file, but also individual implicit information, namely, the flexibility of workspace is enhanced, collaboration exceeding the frames of offices, enterprises, nationalities, etc., is realized, and the possibility of business is widened.

FIG. 55 schematically shows the configuration of a metadata schema managed in the metadata manager 1005. The metadata manager 1005 executes log-in management to a user conference (session) according to the following procedure:

(1) The user (such as a conference presenter) logs in to the system by connecting the IC card or any other portable authentication medium storing the user ID to a connection terminal such as a card reader installed in the conference room.

(2) The presentation controller 1006 transmits the presented user ID information to the directory server 1002 storing the user attributes and acquires site information of the object retaining the user information (a pair of the server ID and the information object ID).

(3) The metadata manager 1005 uses terminal information transmitted from the presentation controller

1006 and records "terminal ID, user ID, use start time."

(4) The presentation controller 1006 transmits a request to the server through the network based on the server ID and requests the server to send the session information associated with the user.

(5) The presentation controller 1006 displays a set of information based on the session information transmitted from the server.

(6) The presenter selects the session out of the set of information for connecting the room to the session.

(7) The presentation controller 1006 transmits a request to the server through the network based on the server ID and requests the server to send the set of information (as a hypertext) associated with the user.

(8) The presentation controller 1006 displays the set of information based on the hypertext transmitted from the server.

(9) The user (presenter) selects the file out of the set of information to invoke the corresponding application for displaying a screen.

The site systems 10 and 20 are connected to each other by the shared workspace server 30 as previously described with reference to FIG. 1. FIG. 3 schematically shows the functional configuration of the shared workspace server 30.

The shared workspace server 30 is placed for sharing the workspace of the object for managing and using tasks (cooperation units) among the sites.

The workspace manager 31 manages the workspaces generated at the sites in the teleconference system 1.

An access control list (ACL) is provided for each workspace. The workspace manager 31 manages or limits use of workspace across a plurality of sites based on authentication information and authorization information read from the IC card held by each conference participant.

In each workspace, sessions for managing connection of the sites, namely, the conference systems, files used in conferences and created as records of conferences, reference information to resources relevant to conferences, and history information of file access and resource access made by the conference participants are managed.

An access control list (ACL) is assigned to the session, file, reference information, and access history information in the workspace. Therefore, the workspace manager 31 not only can manage or limit use in workspace units, but also can perform access control finely across the sites in session units, file units, reference information units, or access history information units in the workspace (described later).

The shared workspace server 30 is implemented as

predetermined server application is started in a general computer system such as a personal computer (PC) and a workstation (WS) connected through the network.

Here, the "site" refers to physical site. In contrast, the "workspace" is a virtual information sharing space. The session is a synchronous work unit. A plurality of workspaces can be placed in one site system. A plurality of sessions are managed in one workspace (see FIG. 3). The specification assumes that one workspace exists in the site system for simplicity of the description. If only one session is established in the workspace, teleconference, session, and workspace are synonymous with each other.

A procedure to establish a session between remote site systems will be discussed with reference to FIG. 49.

If one user logs in to the workspace through the authentication procedure via the medium of the IC card, for example, at one site A, the sessions in which the user is authorized to participate (conferences, corresponding to "projects" described later) are listed on the electronic whiteboard or any other display.

If another user logs in to the identical workspace at the identical site A, the sessions common to the two users are listed. If one session is selected, it is started and the shared files in the session are listed.

If the identical session is selected at another site B, the shared workspace server establishes synchronization between the sites. Consequently, file sharing among the users is realized not only in each site, but also between the sites, enabling the users to perform synchronous work of opening and editing each file.

A session can also be established for holding a teleconference outside the workspace.

Subsequently, a file reference method in the workspace will be discussed.

To share a file in the workspace, basically each user previously registers (archives) the shared file in the workspace. The shared workspace server 30 manages the previously registered file based on the access control list (ACL) (see FIG. 3).

FIG. 50 shows the operation to reference the file in the session.

The user authorized to operate the file sends a file reference request to the shared workspace server 30 through the site server 100 at the site where the user exists.

The shared workspace server 30 responds to the file reference request, takes out the file previously registered in the workspace, and starts application software to open the file.

The shared workspace server 30 provides an

input/output interface with the started application for the site server of the file reference requester and another site server with the session established with the site server of the file reference requester. Consequently, file operation of opening and editing the file is shared between the site servers, enabling the users to perform cooperative work between the remote sites.

To share a file in the workspace, basically each user needs to previously register (archive) the shared file in the workspace. However, of course, it is also possible to share a file brought into the conference by each user without previously registering the file in the workspace. FIG. 51 illustrates a file reference method applied in this case.

The user authorized to operate the file transfers the file and also sends a request for referencing the file to the shared workspace server 30 through the site server 100 at the site where the user exists.

The shared workspace server 30 responds to the file reference request, temporarily registers the transferred file in the workspace as a temporary file, and starts application software to open the file.

The shared workspace server 30 provides an input/output interface with the started application for the site server of the file reference requester and another

site server with the session established with the site
server of the file reference requester. Consequently,
file operation of opening and editing the file is shared
between the site servers, enabling the users to perform
5   cooperative work between the remote sites.

Then, at the termination of the cooperative work using
the temporary file, the shared workspace server 30 erases
the file from the workspace.

In the examples shown in FIGS. 50 and 51, file sharing
10   is realized through the shared workspace server 30 and thus
if the number of sessions established between the site
systems and the number of cooperative works (namely, the
number of started applications) grow, the processing load
on the shared workspace server 30 becomes excessive. Then,
15   the application may be started at the site server of the
file reference requester for distributing the load over
the whole system. FIG. 52 illustrates a file reference
method applied in this case.

The user authorized to operate the file sends a
20   request for referencing the file to the shared workspace
server 30 through the site server 100 at the site where
the user exists. The file may be or may not be previously
registered in the workspace. In the former case, the
previously registered file is taken out from the workspace;
25   in the latter case, the file is taken out from the user's

local disk.

Next, the site server 100 of the file reference requester takes out the file from the workspace and starts application software to open the file. Alternatively, if the request is a request for referencing the file not previously registered, the site server 100 may temporarily register the file as a temporary file.

The site server 100 provides an input/output interface with the started application for another site server with the session established via the shared workspace server 30. Consequently, file operation of opening and editing the file is shared between the site servers, enabling the users to perform cooperative work between the remote sites.

In the associated site server for referencing the file, a request for referencing another file in the session may also occur in the remote cooperative work environment as shown in FIG. 52. In this case, in the site server wherein the application is already started, another application can be started as one method to reference the file. FIG. 53 illustrates a file reference method applied in this case.

At the associated site, the user authorized to operate the file transfers the file and also sends a request for referencing the file to the shared workspace server 30

through the site server 100 at the site where the user exists. The file may be or may not be previously registered in the workspace. In the former case, the previously registered file is taken out from the workspace; in the latter case, the file is taken out from the user's local disk.

The shared workspace server 30 responds to the file reference request and transfers the transferred file to the site server wherein the application is started. Alternatively, if the request is a request for referencing the file not previously registered, the shared workspace server 30 may temporarily register the file as a temporary file.

The site server receiving the file further starts the application for the received file in addition to the current application being started and provides an input/output interface with the started application for another site server with the session established. Consequently, file operation of opening and editing the new file is shared between the site servers, enabling the users to perform cooperative work between the remote sites.

As an alternative file reference method to reference another file in the associated site server for referencing the file in the remote cooperative work environment, the associated site server can start application. FIG. 54 illustrates a file reference method applied in this case.

In the associated site system, a request for referencing the file is sent to the shared workspace server 30 through the site server at the site where the user exists. The file may be or may not be previously registered in the workspace. In the former case, the previously registered file is taken out from the workspace; in the latter case, the file is taken out from the user's local disk.

Next, the site server 100 of the file reference requester takes out the file from the workspace and starts application software to open the file. Alternatively, if the request is a request for referencing the file not previously registered, the shared workspace server 30 may temporarily register the file as a temporary file.

The site server 100 provides an input/output interface with the started application for another site server with the session established via the shared workspace server 30. Consequently, file operation of opening and editing the new file is shared between the site servers, enabling the users to perform cooperative work using the plurality of files between the remote sites. Operation in teleconference system

The configuration of the teleconference system according to the embodiment has been described in above. Hereinafter, examples of the operation in the teleconference system will be discussed in detail.

- 35 -

First example of the operation

(1) The user holds the IC card to the card reader provided in the site system 10 for connecting to the site server 100 for starting user authentication.

(2) The IC card holds reference to the shared workspace server 30 used by the user. The site server 100 connects to the shared workspace server 30 based on the reference. Alternatively, only the user name is held on the IC card and a global directory server (not shown) is installed for managing information concerning each user. The directory server may retain reference to the shared workspace server corresponding to the user.

(3) The site server 100 performs authentication of the user using the IC card for the shared workspace server 30 and logs in. To do this, the information recorded on the IC card may be read for performing authentication of the user for the shared workspace server 30 or the IC card may calculate a part of the authentication protocol message based on the public key cryptography for the shared workspace server 30.

(4) The shared workspace server 30 returns predetermined shared workspace as a response based on the authenticated user information. The shared workspace server 30 extracts necessary information for forming the GUI of the shared workspace based on the information on

the specified shared workspace and transfers the extracted

information to the site system 10. At this time, the shared

workspace server 30 may assign priority using some or all

of the following information to select initial shared

workspace fitted for the user in addition to the user

information:

· Network information such as network address and host

name of the site server 100;

· position information indicating where the site

server 100 is installed;

· information such as a name of the shared workspace,

file name and URL received from the site server 100;

· user's schedule information and current time;

· company user names; and

· information indicating what shared workspaces were

used in the past.

FIG. 4 schematically shows how a plurality of shared

workspaces are joined by hyperlink.

To select the initial shared workspace, the shared

workspace server 30 may assign priority to all shared

workspaces or may assign priority only to a subset of the

shared workspaces previously specified with a bookmark by

the user.

To present a plurality of shared workspaces and

request the user to select one of the shared workspaces,

any, some, or all of the following may be used:

· Use of navigation style in usual hypertext;

· use of menu;

· display of part or all of graph structure formed
by shared workspaces

(5) The user selects a node as required along the graph
structure formed by a plurality of workspaces provided by
the shared workspace server 30, thereby moving and
selecting any desired shared workspace. At this time, to
display a plurality of workspaces, color, size, shape,
position, or their combination may be changed in response
to the priority as described above for aiding in selecting
any shared workspace by the user. This selection step may
be skipped if the default shared workspace is the
user-desired shared workspace.

(6) The GUI of shared workspace 1 is displayed on the
electronic whiteboard 12 in the site system 10.

(7) Here, a first user in the site system 10 selects
a first session among a plurality of sessions in the
displayed shared workspace. Of course, only one session
may exist in the shared workspace. According to this step,
information concerning the site system 10 is registered
in the first session.

(8) A second user in the site system 20 performs
similar operation to that described above. According to

this step, information concerning the site system 20 is registered in the first session.

(9) Upon detection of adding of the site system specifying the same session, the shared workspace server 30 requests all registered site systems to connect to any another site system. Consequently, immediate connection can be made with the associated person of cooperative work. In this case, any of the following may be used as the connection form of the site systems:

· Hub type;

· completely graph type; or

· spanning tree type

(10) As the second user selects the same first session as the first user, screen sharing of the electronic whiteboards 12 and 22 in the site systems 10 and 20 is started. The first and second users can access necessary files required for the conference such as presentation materials through the electronic whiteboards 12 and 22. That is, the users can immediately take out the documents required for cooperative work.

(11) Screen sharing is conducted as input/output from/to the application is hooked.

(12) To conduct screen sharing, a mechanism for responding to input requests from a plurality of sites with changing the character or line color depending on which

- 39 -

site the request is input from may be provided.

(13) A reference history to the files and resources created by the application started by screen sharing is retained in a first shared workspace (see FIG. 3).

5   The user connects the IC card storing the user ID and any other authentication information to the IC card authentication section 1003 connected to the conference room, whereby the user can log in to the system, as described above.

10   When the user logs in to the system, the presentation controller 1006 transmits the user ID information presented via the IC card to the directory service 1002 storing the user attributes and acquires the site information of the object retaining the user information

15   (a pair of the server ID and the information object ID).

The metadata manager 1005 uses terminal information transmitted from the presentation controller 1006 and records the terminal ID, the user ID, and the use start time in association with each other.

20   The presentation controller 1006 transmits a request to the server through the network based on the server ID and requests the server to send the information (hypertext) associated with the user. The presentation controller 1006 displays the information based on the hypertext of

25   the information returned from the server.

The user selects the file out of the information for starting the corresponding application for displaying a screen.

In the teleconference system according to the embodiment, a history of the activities of the user in the session such as creation of and reference to a file and reference to the resources through the electronic whiteboard, whereby the history can be later referenced for immediately passing the result of the cooperative work to the following step. That is, real-time cooperative work and non-real-time cooperative work can be associated with each other.

The registration process and the referencing process of a history of references to files and resources will be discussed hereinbelow.

Process of registering history in Recently Used:

· A computer for providing a plurality of workspaces on the network is provided;

· each user selects (a plurality) of workspaces on the electronic whiteboard or any other client terminal;

· each user opens a file and retrieves and browses information on a web (or in any other wide-area information retrieval system);

· references (URLs) concerning the opened file and the information browsing web page are stored in the client

terminal of the user;

· of the references stored in the client terminal of the user, those to be registered in the workspaces are selected; and

· the selected references are transferred to all workspaces (or selected workspaces), and the received references are registered in the workspaces.

Process of referencing Recently Used:

· Each user selects (a plurality) of workspaces on the electronic whiteboard or the client terminal;

· each user sees the history of the workspaces on the electronic whiteboard or the client terminal;

· a list of the workspaces sorted in "date order," "reference count order," "importance order," or the like is displayed on the electronic whiteboard or the screen of the client terminal;

· at this time, the history of the workspaces is displayed in the format of "individual," "union," or "intersection;" and

· each user can open a file and browse a web by selecting the reference out of the list.

Second example of operation

In a second example of operation which will be described hereinbelow, at a single site, user authentication is performed based on the IC card carried

by each user, relevant shared workspaces are listed, and the user logs out using the IC card.

(1) In the site systems 10 and 20, screens for prompting the user to log in to the system using the IC card are displayed as initial screens on the electronic whiteboards 12 and 22 (or the client terminals of the users) (see FIG. 5).

(2) The user in the site system 10 connects the IC card to the card reader 13 connected to the site server 100 for starting user authentication.

(3) The IC card holds reference to the shared workspace server 30 used by the user. The site server 100 connects to the shared workspace server 30 based on the reference. Alternatively, only the user name may be held on the IC card and a global directory server (not shown) may be installed for managing information concerning each user. In this case, the directory server retains reference to the shared workspace server corresponding to the user.

(4) The site server 100 performs authentication of the user using the IC card for the shared workspace server 30 specified by the IC card and logs in to the workspace. To do this, the information recorded on the IC card may be read for performing authentication of the user for the shared workspace server 30 or the IC card may calculate a part of the authentication protocol message based on the

public key cryptography for the shared workspace server 30.

(5) The shared workspace server 30 retrieves a set of the shared workspaces relevant to the user based on the user information authenticated using the IC card, and transmits a list of the retrieval result to the site server 100.

(6) The site server 100 displays the set of the workspaces transmitted from the shared workspace server 30 (in the screen, the workspace is represented as project). FIG. 6 shows an example of listing of the workspace set transmitted from the shared workspace server 30. In the example shown in the figure, a plurality of projects (workspaces) provided for Watanabe, one of the users, as a result of user authentication using the IC card are listed.

(7) To end the use of the system, the user can enter an end command using the GUI provided on the electronic whiteboard or the client terminal or can connect the IC card to the site system to enter an end command. FIG. 7 shows an example of connecting the IC card to the site server for entering a command to end the use of the system.
Third example of operation

Next, in a third example of operation which will be described hereinbelow, a plurality of IC cards are

connected to the same site system, shared workspaces relevant to a plurality of users are displayed, and a file retained in the shared workspace or reference to a file is specified for starting application.

5   (1) In the site systems 10 and 20, screens for prompting the user to log in to the system using the IC card are displayed as initial screens on the electronic whiteboards 12 and 22 (or the client terminals of the users) (see FIG. 5).

10   (2) The user connects a second IC card to the site server 100 in the site system 10 for starting user authentication.

       (3) The second IC card holds reference to the shared workspace server 30 used by the user. The site server 100

15   connects to the shared workspace server 30 based on the reference. Alternatively, only the user name may be held on the second IC card and a global directory server (not shown) may be installed for managing information concerning each user. The directory server retains

20   reference to the shared workspace server corresponding to the user.

       (4) The site server 100 performs authentication of the user using the second IC card for the shared workspace server 30 and logs in to the workspace. To do this, the

25   information recorded on the second IC card may be read for

performing authentication of the user for the shared workspace server 30 or the second IC card may calculate a part of the authentication protocol message based on the public key cryptography for the shared workspace server 30.

(5) The shared workspace server 30 retrieves a set of the shared workspaces relevant to the user based on the user information authenticated, and transmits a list of the retrieval result to the site server 100.

(6) The site server 100 displays the set of the workspaces transmitted from the shared workspace server 30 on the electronic whiteboard 12 (or the client terminal of the user). In FIG. 8, a plurality of projects (workspaces) provided for Mr. Horikiri, one of the users, as a result of user authentication using the IC card are listed.

(7) A different user connects a first IC card to the site server 100 in the site system 10 for starting user authentication.

(8) The first IC card holds reference to the shared workspace server 30 used by the user. The site server 100 connects to the shared workspace server 30 based on the reference. Alternatively, only the user name may be held on the first IC card and a global directory server (not shown) may be installed for managing information

concerning each user.

(9) The site server 100 performs authentication of the user using the first IC card for the shared workspace server 30 and logs in.

(10) The shared workspace server 30 retrieves a set of the shared workspaces relevant to the user based on the user information authenticated, and performs operation on the set and the set retained for the site server 100 at present. The operation may contain a sum set, a product set, a difference set, a complementary set, and any combination thereof. In the embodiment, the shared workspaces relevant to the user authenticated by the first IC card is:

· project A,

· project Y,

· project Z, and

· project B.

And the shared workspaces relevant to the user authenticated by the second IC card is:

· project X,

· project Y,

· project Z, and

· project W.

Therefore, in the embodiment, a product set of the above two product sets is retrieved, and the workspace set

information as listed below is transmitted from the shared

workspace server 30.

· project Y

· project Z

The site server 100 lists the received workspace set

information on the electronic whiteboard 12 or the client

terminal of the user. FIG. 9 shows a screen example of

listing the set of the shared workspaces relevant to the

two users. In the example shown in the figure, the set of

the workspaces provided by the product set of the shared

workspaces relevant to the users Mr. Watanabe and Mr.

Horikiri

(11) The user selects any desired shared workspace

out of the listing produced by the site server 100. The

site server 100 responds to the selection and requests the

shared workspace server 30 to transmit information of

selected shared workspace 1.

(12) The shared workspace server 30 transmits the

information of selected shared workspace 1. Here, an

example of transmitting a list of references to files

retained in the shared workspace will be discussed.

However, the shared workspace may retain sessions,

references to any other shared workspace, and the like in

addition to files and references to files (see FIG. 3).

(13) Upon reception of the list of references to files

- 48 -

as the information of shared workspace 1 from the shared
workspace server 30, the site server 100 displays the list
on the screen. FIG. 10 shows a screen display example of
the file reference list (K to N) retained in the shared
workspace (project Y).

(14) The user can select any desired file through the
file reference list displayed the electronic whiteboard
12 or his or her client terminal. Here, assuming that the
user selects file K, the site server 100 transmits a message
indicating that the user selects file K to the shared
workspace server 30.

(15) Upon reception of the message containing the
reference to the file K transmitted from the site server
100, the shared workspace server 30 starts the application
program associated with the file K.

(16) The shared workspace server 30 captures output
of graphics performed by the started application program
and transmits the output to the site server 100 as a message.
The site server 100 performs graphic output on the
electronic whiteboard 12 managed by the site server 100,
thereby realizing application sharing in the site system
10. FIG. 11 shows an example wherein the application
associated with the selected file at the site is started
and the file is displayed on the electronic whiteboard at
the site. In the example shown in the figure, the screen

of the selected file K is displayed in conference room A.

(17) The user can perform screen input using a user input unit such as a pointing device or a keyboard on the electronic whiteboard 12 (or the client terminal) (or extended user interface in the workspace of the conference room). The input performed by the user is transmitted from the site server 100 to the shared workspace server 30 as an input message, and is passed to the application operating in the shared workspace server 30. FIG. 12 shows how the user performs screen input using the user input unit such as the pointing device or the keyboard on the electronic whiteboard 12 (or the client terminal). In the example shown in the figure, an annotation is made on the display screen of the file K in conference room A.

(18) The user can use the user input unit on the electronic whiteboard 12 (or the client terminal) to give an end command to the application operating in the shared workspace server 30. The operation of the application operating in the shared workspace server 30 terminates in response to the end command. FIG. 13 shows a display example of the electronic whiteboard 12 as a result of terminating the operation of the application in response to the user command. In the example shown in the figure, in conference room A, the screen is returned to the screen displaying the file reference list retained in the shared

workspace (project Y) as a result of giving the end command of the application associated with the file K.

(19) Further, to end the use of the teleconference system, the user may enter an end command through the GUI provided on the electronic whiteboard 12 (or the client terminal) or may enter an end command by connecting the IC card to the site system. FIG. 14 shows a screen display example of the electronic whiteboard 12 when the user terminates the use of the system by connecting the IC card to the site server 100.

The case where the shared workspace is used from conference room A corresponding to the site system 10 has been described; of course, however, the shared workspace can also be accessed in a similar manner from any other site.

FIG. 15 shows an example wherein the user connects the IC card to the site server 200, authentication processing is performed, and relevant shared workspaces (projects) are listed on the electronic whiteboard 22 in conference room B corresponding to the site system 20.

FIG. 16 shows an example wherein references to files contained in project Y are listed as a result of the user selecting project Y on the electronic whiteboard 22 in conference room B.

FIG. 17 shows an example wherein the application

associated with file K is started in the shared workspace server 30 and performs graphic output on the electronic whiteboard 22 as a result of the user selecting file K on the electronic whiteboard 22 in conference room B.

FIG. 18 shows an example wherein the display is returned to listing of references to files contained in the project as a result of the user giving an application end command on the electronic whiteboard 22 in conference room B.

FIG. 19 shows how the user connects the IC card in conference room B for terminating the use of the workspace. Fourth example of operation

Next, in a fourth example of operation which will be described below, as the same shared workspace is specified in the site systems 10 and 20, the electronic whiteboards 12 and 22, the components of the site systems 10 and 20, are connected and the video and audio servers 11 and 21, the components of the site systems 10 and 20, are connected.

(1) In the operation example, only one session is managed in each shared workspace and a plurality of site systems select the same shared workspace, whereby the site systems are connected and the session is started.

Although not described below in detail, a scheme in which the same shared workspace is specified and then a session start command is given, whereby the site systems

are connected and the session is started may be used rather than the scheme in which at the same time as the same shared workspace is selected, the site systems are connected and the session is started.

5   (1) As the user connects the first IC card to the site server 100 in the site system 10, the shared workspaces relevant to the user are listed on the display (electronic whiteboard 12) in the site system 10 (see FIG. 20).

        (2) Here, it is assumed that the user selects shared
10   workspace 1 named "project X" from among the shared workspaces displayed on the electronic whiteboard 12.

        (3) The site system 10 transmits the reference to the shared workspace 1 selected by the user to the shared workspace server 30.

15   (4) The shared workspace server 30 transmits a list of the references to the files retained in the shared workspace 1 to the site server 100. The shared workspace server 30 retains the network address of the site server 100 to make it possible to connect the site systems
20   selecting project X of the shared workspace 1.

        (5) The site server 100 displays the received file reference list on the electronic whiteboard 12 (see FIG. 21).

        (6) As a different user connects the second IC card
25   to the site server 200 in the site system 20 corresponding

to conference room B, the shared workspaces relevant to the user are listed on the display (electronic whiteboard 22) in the site system 20 (see FIG. 22).

(7) Here, it is assumed that the user in conference room B selects shared workspace 2 named "project X" from among the shared workspaces displayed on the electronic whiteboard 22.

(8) The shared workspace server 30 transmits a list of the references to the files retained in the shared workspace 1 to the site server 200 in response to the selection operation. The shared workspace server 30 retains the network address of the site server 200 to make it possible to connect the site systems selecting project X of the shared workspace 1.

(9) According to the described procedure, the number of the site servers selecting the same shared workspace becomes two or more. Thus, the shared workspace server 30 requests every registered site server to connect to any other site server. More particularly, the shared workspace server 30 requests the site server 100 to connect to the site server 200 and requests the site server 200 to connect to the site server 100.

(10) The site server 100 and the site server 200 issue requests for connecting the video and audio servers to each other and connect the electronic whiteboards 12 and 22 to

the shared workspace server 30 to start sharing input/output to/from application.

(11) In the embodiment, the site systems 10 and 20 hold the video and audio servers 11 and 21 respectively. The site server 100 requests the video and audio server 11 to receive video and audio from the video and audio server 21. Likewise, the site server 200 requests the video and audio server 21 to receive video and audio from the video and audio server 11.

(12) The video and audio server 11 starts to receive video and audio from the video and audio server 21, and the video and audio server 21 starts to receive video and audio from the video and audio server 11. FIG. 23 shows how the video and audio data received from the associated video and audio server is displayed on the electronic whiteboards 12 and 22.

(13) Here, it is assumed that the user selects file P through the graphical user interface presented on the electronic whiteboard 12 in the site system 10. The shared workspace server 30 starts the application associated with the file in response to the selection operation.

(14) The shared workspace server 30 transfers screen display performed by the application to the electronic whiteboards 12 and 22 in the site systems 10 and 20.

(15) The application screen is displayed on the

electronic whiteboards 12 and 22 based on the information of the screen display transmitted from the shared workspace server 30. FIG. 24 shows how the information of the screen display received from the shared workspace server 30 is displayed on the electronic whiteboards 12 and 22 in the site systems 10 and 20.

(16) The users in the site systems 10 and 20 make entries using the user input units such as the keyboard or the pointing device on the electronic whiteboards 12 and 22 and exchange information using the video and audio servers 11 and 21 for advancing the conference.

FIGS. 25 through 28 show how the users at the sites make entries through the electronic whiteboards and exchange multimedia information using the video and audio servers for advancing the conference.

In FIG. 25, the users at the sites share the same conference environment using the application start screens displayed on the electronic whiteboards and camera images.

In FIG. 26, the user in conference room A indicates specific content of the file through the application screen on the electronic whiteboard and makes an inquiry of the user in conference room B by voice.

In FIG. 27, the user in conference room A receives an answer from the user in conference room B on a voice (audio) basis.

In FIG. 28, the user in conference room A corrects the file content using the graphical user interface on the application screen output onto the electronic whiteboard. The correction content is sent to the site server 200 corresponding to conference room B and is reflected on the screen display on the electronic whiteboard 22 and a history is registered in the shared workspace server 30.

(17) The user operating the electronic whiteboard 12 enters an application end command (see FIG. 29), the file used in the application is stored in a file server (not shown) specified by the reference in the shared workspace 1 or 2.

(18) In the site server 200, the user connects the second IC card, thereby entering a command for logging out from the site server 200 and terminating the use of the system. Accordingly, the site server 200 terminates the session (see FIG. 30).

(19) In the site server 100, the user connects the first IC card, thereby entering a command for logging out from the site server 100 and terminating the use of the system (see FIG. 31).

Fifth example of operation

In a fifth example operation which will be described below, the user as the presenter distributes a shared document as presentation material to other users as

conference participants.

In the conference room according to the embodiment, an extended user interface, such as a projection screen, is provided. FIG. 45 shows a configuration example of the user interface screen. On the screen shown in the figure, icons are displayed in a one-to-one correspondence with the users participating in the conference (logging in to the system). For example, the icon of the current presenter is highlighted. Buttons for "selectively distributing" or "distributing to all participants" the shared document used in the presentation are also provided on the screen. An operation procedure applied when "selectively distributing" is selected will be discussed below:

(1) Each participant who wants electronic distribution of information from the presenter holds his or her IC card over the IC card authentication section 1003 installed in the conference room and connects to the system via the IC card, thereby indicating his or her intention to receive distribution. FIG. 46 shows how two users hold their IC cards over the read face of the IC card authentication section 1003 installed on a table.

(2) The metadata manager 1005 manages the object for managing conference participation members. As the participant holds the IC card, the user ID is added to the

conference member list.

(3) The right of adding to the file directory held by each user is given.

(4) As the presenter enters a material distribution command, the presenter can check the users registered as the participants at present on the screen (see FIG. 45).

(5) As the presenter supports execution of material distribution, the information concerning each registered user is acquired and a file is uploaded into the server ID and the object ID of the object retaining the information on the user from the user information.

(6) The metadata manager 1005 records the file ID, transmitter, receiver list, and time in a database.

FIG. 47 is a flowchart to show a file distribution processing procedure applied when one user displays a plurality of files.

To begin with, when a file list is acquired (step S101), file selection display is produced based on the set of the distribution files (step S102). File distribution is started (step S103).

Here, a participant list is acquired from the set of the conference participants (step S104). As each user is registered, namely, the user holds the IC card over the read face of the IC card authentication section 1003 (step S107), the participant is additionally registered in the

participant set (step S108).

Distribution destinations are selected out of the participant list (step S105) and the file is distributed (step S106).

FIG. 48 is a flowchart to show a file distribution processing procedure applied when a plurality of users display a plurality of files.

To begin with, when a file list is acquired (step S111), file selection display is produced based on the set of the distribution files (step S112). Whether or not file distribution is to be executed is determined (step S113).

If file distribution is to be executed, file distribution is started (step S114).

Here, a participant list is acquired from the set of the conference participants (step S115). As each user is registered, namely, the user holds the IC card over the read face of the IC card authentication section 1003 (see FIG. 46) (step S118), the participant is additionally registered in the participant set (step S119).

Distribution destinations are selected out of the participant list (step S116) and the file is distributed (step S117).

On the other hand, if it is determined that file distribution is not started (step S113), whether or not the conference is to be continued is further determined

(step S120). To continue the conference, the distribution file is determined (step S121) and log-out is conducted. Here, the files to be distributed include not only the files previously registered in the workspace, but also the temporary files brought into the conference by the user and temporarily registered in the workspace.

The file distribution processing is performed as shown in FIGS. 47 and 48, whereby a document can be presented for each participant in the conference without the need for each user to possess a machine storing the document file required as reference information in the process of the conference. Likewise, each participant receiving disclosure of the document can also take the document home without the need for possessing a machine storing the document file. Further, the server records the fact that the document is passed, whereby information retrieval with the conference situation or context as a key can be conducted.

Operation of shared workspace server

In the teleconference system 1 according to the invention, the conference system is operated at a plurality of sites and the shared workspace server 30 connects the sites to each other.

The shared workspace server 30 is placed for sharing the workspace of the object for managing and using tasks

(cooperation units) among the sites, and manages sessions

for managing connection of the conference systems, files

used in conferences and created as records of conferences,

reference information to resources relevant to conferences,

5   and history information of file access, etc., made by

conference participants.

The conference participant can operate the graphical

user interface provided by the shared workspace, thereby

connecting to the multimedia communication conference

10   system without being aware of the call address of each

multimedia communication conference system and easily

accessing information in the files relevant to the

conference and the like from the conference system.

A shared workspace flow realized through the

15   mediation of the shared workspace server 30 will be

discussed.

FIG. 32 schematically shows a general shared

workspace flow.

When workspace is started, first, candidates for the

20   workspace are displayed on the electronic whiteboard in

the site system (step S1).

The user selects any desired workspace through the

workspace candidate display (step S2).

The shared workspace server 30 opens the selected

25   workspace (step S3) in response to the selection operation

and adds the workspace as an active workspace for use of the workspace (step S5).

FIG. 33 is a flowchart to show a processing procedure for use of the workspace.

The workspace selected by the user is opened and the files and HTTP objects contained therein are referenced through the electronic whiteboard (step S11).

When the file or object is referenced, object reference registration processing is performed (step S12).

As the conference proceeds, creation of a new file, change of a file, reference to an object (such as external resource), and the like are performed, and a history of such conference activities is retained in sequence. The retained history is later referenced, whereby the result of the cooperative work can be immediately utilized in the next step.

Then, if the user enters a workspace use end command, workspace termination processing is performed (step S13).

If the user enters a command for switching to another workspace, workspace switching processing is performed (step S14).

If the user enters a command for starting another workspace, a subworkspace is started (step S15).

FIG. 34 shows the workspace termination processing procedure in the flowchart of FIG. 33 in more detail.

To begin with, processing of saving (storing) unregistered history is performed (step S21).

Next, the workspace being used is deleted from the active workspaces (step S22) and processing of closing workspace is performed (step S23).

FIG. 35 shows the object reference registration processing procedure in the flowchart of FIG. 33 in more detail.

To begin with, only one workspace is taken out from the set of the active workspaces (step S31). At this time, if no workspaces exist, the processing routine is terminated.

On the other hand, if a workspace exists, whether or not reference is to be added is determined (step S32).

If there is no reference to be added, the process returns to step S31 and another workspace in the active workspace set is processed.

If the reference to be added exists, the reference is added to the workspace (step S33) and then the process returns to step S31 and another workspace in the active workspace set is processed.

FIG. 36 shows the subworkspace starting processing procedure at step S15 in the flowchart of FIG. 33 in more detail.

To begin with, whether or not simultaneous use of

workspace is made is determined (step S41).

To make exclusive use, workspace deactivation processing is performed (step S42) and then workspace start processing is performed (step S43).

To make simultaneous use, step S42 is skipped and workspace start processing is performed (step S43).

FIG. 37 shows the workspace deactivating processing procedure at step S42 in the flowchart of FIG. 36 in more detail.

In this case, the workspace is changed from active workspace to inactive workspace (step S51) and then the workspace is deactivated.

FIG. 38 shows the workspace switching processing procedure at step S14 in the flowchart of FIG. 33 in more detail.

To begin with, the current workspace is deactivated (step S61). The workspace is deactivated according to the procedure shown in FIG. 37.

Next, workspace candidates are displayed on the electronic whiteboard or any other display (step S62) and the user uses the graphical user interface on the display screen to select the workspace to switch to (step S63).

Then, the process is returned to the deactivated workspace (step S64).

FIG. 39 shows the unregistered history save

processing procedure at step S21 in the flowchart of FIG. 34 in more detail.

To begin with, one object is taken out from the unregistered history (step S71). At this time, if the history is empty (step S72), the processing routine is terminated.

On the other hand, if unregistered history exists (step S72), whether or not object is to be added is determined (step S73). If no object is to be added, the process returns to step S71 and another unregistered history processing is performed.

If object is to be added, the reference is added to the workspace (step S74). Then, the process returns to step S71 and another unregistered history processing is performed.

FIG. 40 is a flowchart to show a workspace reference processing procedure.

To begin with, the reference mode of a plurality of workspaces is specified (step S81).

A common object to all active workspaces is displayed (step S82) or the objects of all active workspaces are displayed (step S83) in response to the specified reference mode.

FIG. 41 is a flowchart to show a session start processing procedure.

To begin with, the clients already starting the specified session are extracted (step S91).

A request for connecting to a new client is transmitted to all clients already starting the session (step S92).

While the specific embodiment of the invention has been described in detail, it is to be understood that the modifications will be apparent to those skilled in the art without departing from the spirit of the invention. That is, the disclosure of the invention is for illustrative purposes only, and it is to be understood that the description of the invention is not restrictive. The scope of the invention is therefore to be determined solely by the appended claims.

According to the shared workspace server manages a session for managing connection of the site systems, a file used in a conference and created as a record of the conference, reference information to a resource relevant to the conference, and history information of file access made by conference participants.

Therefore, according to the teleconference system according of the invention, the conference participant can operate the graphical user interface provided by the shared workspace, thereby connecting to the multimedia communication conference system without being aware of the

call address of each multimedia communication conference system and easily accessing information in the files relevant to the conference and the like from the conference system.

5   The shared workspace server provides a user interface for connecting a session and making reference to a file and/or a resource.

When a client starts a session, the shared workspace server instructs all other clients already starting the
10 session to connect to the client.

The site systems correspond to separately operating conference systems and a conference is operated for each site. Each of the site systems includes an electronic whiteboard for providing a graphical user interface
15 provided by a shared workspace, a video and audio server for coding and decoding video and audio and then transmitting and receiving video and audio to and from any other site system for sharing motion and behavior of the participants at the sites, an authentication unit for
20 authenticating identification of the conference participants, and a site server for managing a session in the site system, a file used in a conference and created as a record of the conference, reference information to a resource relevant to the conference, and history
25 information of file access made by the conference

participants.

The site system provides an interface for enabling the conference participating users to collaborate, and controls presentation. The presentation control is implemented in various manners. For example, user interfaces of a general computer, such as a display, a keyboard, a mouse, and a tablet may be installed in a conference room as they are. Alternatively, a projection screen onto a wall through a projector, a camera for capturing user operation on the projection screen, and a whiteboard are used in combination to make up a user interface. Application operation buttons such as print, display, and listing of shared documents are disposed on the wall. Of course, a probe for detecting a user command without user's consciousness may be disposed in the conference room.

Information can be accessed irrespective of whether or not the conference participating user possesses a computer machine such as a PC or a PDA device depending on how the presentation control is implemented. That is, computers can be introduced as joined together with the workspace, and the computer capabilities of information collection, management, analysis, any other computation processing, information display, information distribution, etc., can be provided for the user who is unaware of them.

Not only formatted information such as information in a computer file, but also individual implicit information, namely, the flexibility of workspace is enhanced, collaboration exceeding the frames of offices, enterprises and nationalities is realized, and the possibility of business is widened.

According to the teleconference support method according to the invention, the conference participant can operate the graphical user interface provided by the shared workspace, thereby connecting to the multimedia communication conference system without being aware of the call address of each multimedia communication conference system and easily accessing information in the files relevant to the conference and the like from the conference system.

The teleconference support method according to the invention may further include the step of providing a user interface for displaying workspace candidates required for the user to select a workspace.

The step of managing use of the workspace may include the step of providing a user interface for making reference to a file and/or a resource.

The step of managing use of the workspace may include the step of registering reference to a file and/or a resource.

The step of managing use of the workspace may include the steps of switching a workspace, starting a subworkspace, and terminating the workspace.

In the step of managing use of the workspace, the original workspace may be deactivated in the step of switching a workspace and/or the step of starting a subworkspace.

In the step of managing use of the workspace, when a client starts a session, all other clients already starting the session may be instructed to connect to the client.

The computer program according to the invention is a computer program described in a computer-readable format so as to realize predetermined processing in a computer system. In other words, the computer program according to the invention is installed in a computer system, whereby the cooperative effect is demonstrated in the computer system and similar advantages to those of the teleconference support method according to the invention can be provided.

As described in detail, according to the invention, there can be provided the advantageous teleconference system and the advantageous teleconference support method for making it possible to connect a plurality of sites and realize remote cooperative work.

According to the invention, there can be provided the advantageous teleconference system, the advantageous teleconference support method, and the advantageous computer program for making it possible to provide a shared

5   workspace for one conference participant to easily connect conference systems with any other conference participant and share information among them.

According to the invention, there can be provided the advantageous teleconference system, the advantageous

10   teleconference support method, and the advantageous computer program for making it possible to realize cooperation call setting and information sharing from a plurality of conference systems using multimedia.

According to the invention, there can be provided the

15   advantageous teleconference system, the advantageous teleconference support method, and the advantageous computer program for making it possible to smoothly collect, manage, analyze, display and distribute information used in a conference based on easy user operation.

20   According to the invention, a document can be presented for each participant in the conference without the need for each user to possess a machine storing the document file required as reference information in the process of the conference. Likewise, each participant

25   receiving disclosure of the document can also take the

document home without the need for possessing a machine

storing the document file. Further, the server records the

fact that the document is passed, whereby information

retrieval with the conference situation or context as a

5 key can be conducted.

Although the present invention has been shown and

described with reference to specific preferred embodiments,

various changes and modifications will be apparent to those

skilled in the art from the teachings herein. Such changes

10 and modifications as are obvious are deemed to come within

the spirit, scope and contemplation of the invention as

defined in the appended claims.